TRANSISTORS, HIGH POWER, NPN,

BASED ON TYPE 2N6275

ESCC Detail Specification No. 5203/029

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BASED ON TYPE 2N6275

ESA/SCC Detail Specification No. 5203/029

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 2	January 1983	-	-
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications agreed on the basis of Policy DCR's 21022 and 21019 "Appendices to Detail Specifications" and the following DCR's:-		
		Cover page		None
		DCN		None
		Table 1(a)	: Figure reference changed to 2	23087
			: Lead finish redefined	21025
		Table 1(b)	: No. 7, T_{op} changed to $-65°C$	22175
		Figure 2	: Dimension Øb amended	22175
		Para. 2	: MIL-STD-1276 deleted	21025
			: MIL-STD-105 deleted	23087
		Para's 4.2.3 and 4.2.4	: Amended	23087
		Para. 4.4.2	: Lead definition redefined	21025
		Table 2	: No. 1, I_C condition changed to 50mAdc	22175
			: No. 6, V_{EB} changed to $V_{EB(OFF)}$	22175
			: Notes reference changed to Page 16	22175
		Table 3	: Note 2 changed to LTPD7	23087
		Figure 4	: Earth removed from base terminal	22175
		Table 5	: T_C changed to T_{amb}	23087
			: New Note added	23087
'A'	Feb. '92	P1. Cover page		None
		P2. DCN		None
		P5. Para. 1.2	: Paragraph amended	21021
		P10. Para. 2	: "ESA/SCC Basic Spec. No. 23500" added	21025
		Para. 4.2.2	: Bond Strength and Die Shear Test deviations deleted	23499
			: PIND deviation deleted	21043
		P11. Para. 4.2.3	: Radiographic Inspection deviation deleted	21049
		Para. 4.2.4	: Bond Strength and Die Shear Test deviations deleted	23499
		P17. Table 3	: Reference to Note 2 deleted	21047
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.		
'B'	Aug. '96	P1. Cover page		None
		P2. DCN		None
		P5. Para. 1.7	: Text amended	21083

TABLE OF CONTENTS

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Transistor, High Power, NPN, based on Type 2N6275. It shall be read in conjunction with ESA/SCC Generic Specification No. 5000, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

See Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the transistors specified herein are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the transistors specified herein is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the transistors specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram showing lead identification, of the transistors specified herein, is shown in Figure 3.

1.7 HIGH TEMPERATURE TEST PRECAUTIONS

For tin-lead plated or solder-dipped lead finish, all tests to be performed at a temperature that exceeds +125°C shall be carried out in a 100% inert atmosphere.

TABLE 1(a) - TYPE VARIANTS

VARIANT	CASE	FIGURE	LEAD MATERIAL AND FINISH
01	TO3	2	D2
02	TO3	2	D3 or D4

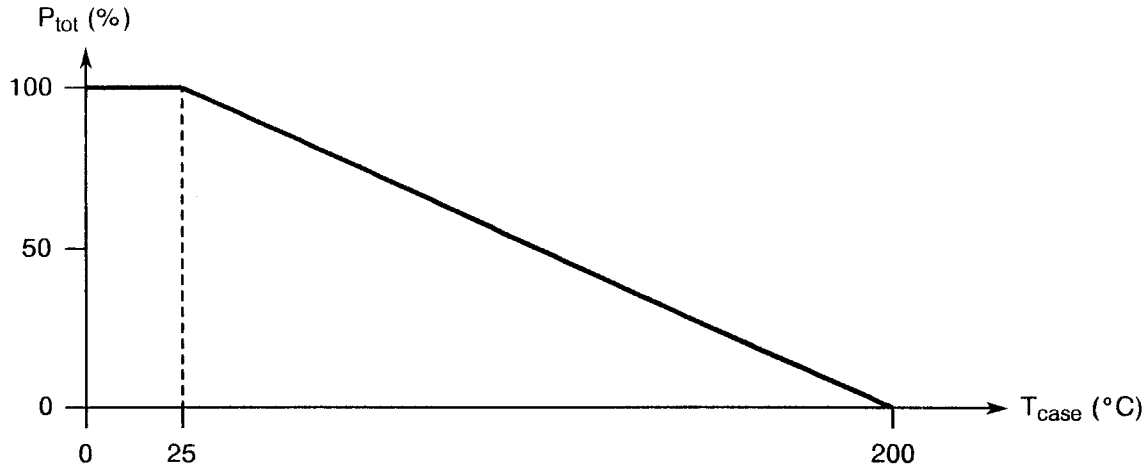
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Collector-Base Voltage	V_{CB}	140	Vdc	
2	Collector-Emitter Voltage	V_{CE}	120	Vdc	
3	Emitter-Base Voltage	V_{EB}	6.0	Vdc	
4	Collector Current (Continuous)	I_C	50	Adc	
5	Peak Collector Current	$I_{C(PK)}$	100	Adc	
6	Power Dissipation (Continuous)	P_{tot}	250	W	Note 1
7	Operating Temperature Range	T_{op}	−65 to +200	°C	T_{amb}
8	Storage Temperature Range	T_{stg}	−65 to +200	°C	
9	Soldering Temperature	T_{sol}	+260	°C	Note 2

NOTES

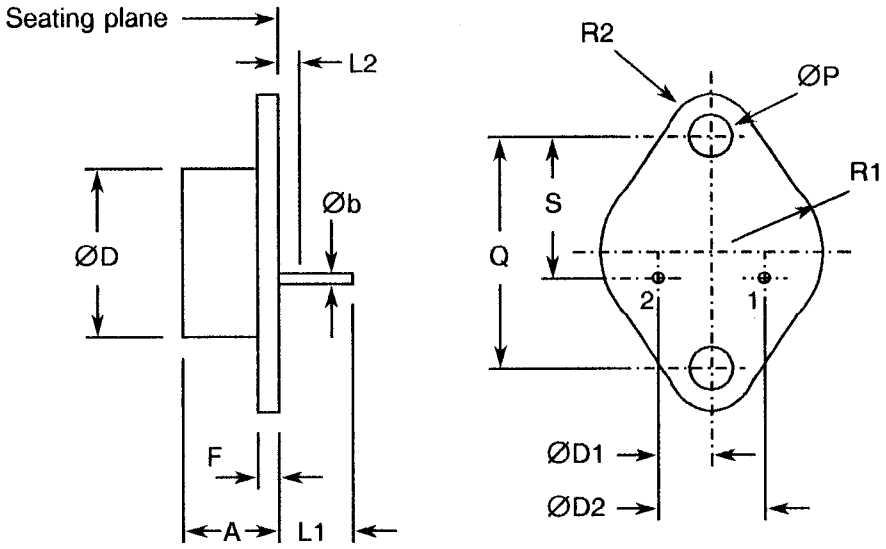
1. At $T_{case} \leq +25°C$. For derating at $T_{case} > +25°C$, see Figure 1.
2. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

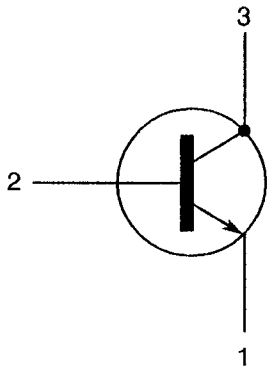


SYMBOL	INCHES		MILLIMETRES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.250	0.450	6.35	11.43	
Øb	0.055	0.063	1.40	1.60	1, 2
ØD	-	0.875	-	22.23	
ØD1	0.205	0.225	5.21	5.72	
ØD2	0.420	0.440	10.67	11.18	
F	0.060	0.135	1.52	3.43	
L1	0.312	0.500	7.92	12.70	
L2	-	0.050	-	1.27	3
ØP	0.151	0.161	3.84	4.09	
Q	1.177	1.197	29.90	30.40	
R1	0.495	0.525	12.57	13.34	
R2	0.131	0.188	3.33	4.78	
S	0.655	0.675	16.64	17.15	

NOTES

1. Both leads.
2. Øb applies between L1 and L2.
3. The diameter of the leads within this zone is not controlled.

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Emitter.
2. Base.
3. Collector.

NOTES

1. The collector is internally connected to the case.

2. APPLICABLE DOCUMENTS

The following documents for part of this specification and shall be read in conjunction with it:-

(a) ESA/SCC Generic Specification No. 5000 for Discrete Semiconductor Components.

(b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices.

(c) ESA/SCC Basic Specification No. 23500, Requirements for Lead Materials and Finishes for Components for Space Application.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply. In addition, the following abbreviations are used:-

$I_{S/B}$ = Second Breakdown Current.
f_T = Current Gain Band-width Product.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the transistors specified herein are stated in this specification and ESA/SCC Generic Specification No. 5000. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements are do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in Tests (Chart III)

(a) H.T.R.B. test: Shall not be performed.

4.2.4 Deviations from Qualification Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the transistors specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the transistors specified herein shall be 18 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The test conditions shall be as follows:-

Test Condition: 'A' (Tension).
Applied Force: 20 Newtons.
Duration: 10 seconds.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the transistors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

The case shall be hermetically sealed and have a metal body with hard glass seals and the lid shall be welded, brazed, or preform soldered.

4.4.2 Lead Material and Finish

The lead material shall be Type 'D' with either Type '2' or Type '3 or 4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

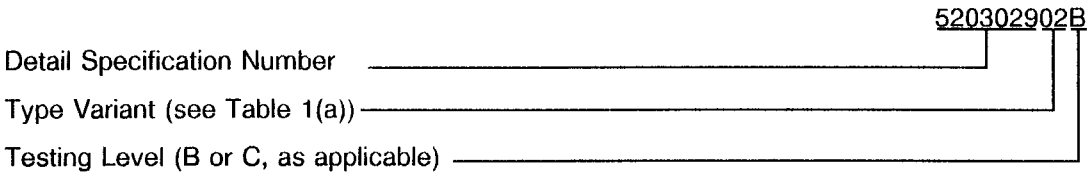
(c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figures 2 and 3.

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:-



4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

When it is considered that the component is too small to accommodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows:-

(a) Lead Identification.

(b) The SCC Component Number.

(c) Traceability Information.

The marking information in full shall accompany each component in its primary package.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The measurements shall be performed at $T_{amb} = -55(+5-0)$ and $+150(+0-5)$ °C respectively.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing the electrical measurements listed in Tables 2 and 3 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified for a given parameter in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.4 Electrical Circuits for Burn-in

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
1	Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	3011 Bias Cond. 'D'	I_C = 50mAdc I_B = 0Adc Note 1	120	- -	V
2	Base Saturation Voltage	$V_{BE(SAT)}$	3066 Bias Cond. 'A'	I_C = 20Adc I_B = 2.0Adc Note 1	-	1.8	V
3	Base-Emitter ON Voltage	$V_{BE(ON)}$	3066 Bias Cond. 'B'	I_C = 20Adc V_{CE} = 4.0Vdc Note 1	-	1.8	V
4	Collector Saturation Voltage	$V_{CE(SAT)}$	3071	I_C = 50Adc I_B = 10Adc Note 1	-	3.0	V
5	Emitter-Base Reverse Current	I_{EBO}	3061 Bias Cond. 'D'	V_{EB} = 6.0Vdc I_C = 0Adc	-	100	µA
6	Collector Cut-off Current	I_{CEX}	3041 Bias Cond. 'A'	V_{CE} = 120Vdc $V_{EB(OFF)}$ = − 1.5Vdc	-	10	µA
7	Collector Cut-off Current	I_{CEO}	3041 Bias Cond. 'C'	V_{CE} = 60Vdc I_B = 0Adc	-	50	µA
8	D.C. Forward Current Transfer Ratio 1	h_{FE1}	3076	V_{CE} = 4.0Vdc, I_C = 20Adc Note 1	30	120	-
9	D.C. Forward Current Transfer Ratio 2	h_{FE2}	3076	V_{CE} = 4.0Vdc, I_C = 50Adc Note 1	10	-	-

NOTES: See Page 16.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST FIG.	TEST CONDITIONS (NOTE 2)	LIMITS		UNIT
						MIN	MAX	
10	Second Breakdown Current	$I_{S/B}$	3051	-	V_{CE} = 20Vdc	5.0	-	A
11	Current Gain Band-width Product	f_T	3261	-	V_{CE} = 10Vdc I_C = 1.0Adc	30	-	MHz
12	Output Capacitance	C_{ob}	3236	-	V_{CB} = 10Vdc I_E = 0Adc f = 100kHz	-	600	pF
13	Pulse Rise Time	t_r	-	4	V_{CC} = 80Vdc I_C = 20Adc I_B = 2.0Adc $V_{BE(OFF)}$ = 5.0Vdc	-	0.35	µs
14	Pulse Storage Time	t_s	-	4	V_{CC} = 80Vdc I_C = 20Adc I_{B1} = 2.0Adc I_{B2} = 2.0Adc	-	0.8	µs
15	Pulse Fall Time	t_f	-	4	V_{CC} = 80Vdc I_C = 20Adc I_{B1} = 2.0Adc I_{B2} = 2.0Adc	-	0.25	µs

NOTES

1. Pulsed measurement: Pulse Length ≤ 300us, Duty Cycle ≤ 2.0%.
2. Measurements shall be performed on a sample basis, LTPD7.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

TABLE 3(a) - T_{amb} = +150(+0−5) °C

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
6	Collector Cut-off Current	I_{CEX}	3041 Bias Cond. 'A'	V_{CE} = 120Vdc $V_{BE(OFF)}$ = −1.5Vdc	-	1.0	mA

NOTES

1. Pulsed measurement: Pulse Length ≤300us, Duty Cycle ≤2.0%.

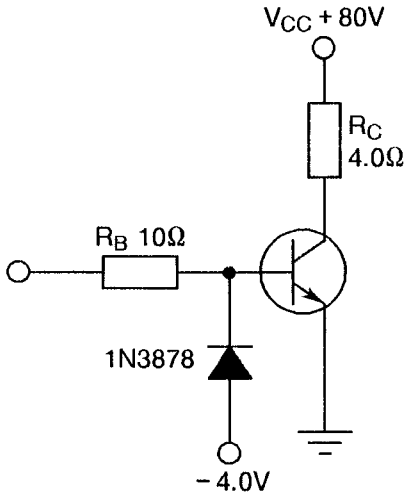
TABLE 3(b) - T_{amb} = −55(+5−0) °C

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
7	D.C. Forward Current Transfer Ratio	h_{FE1}	3076	V_{CE} = 4.0Vdc I_C = 20Adc Note 1	15	-	-

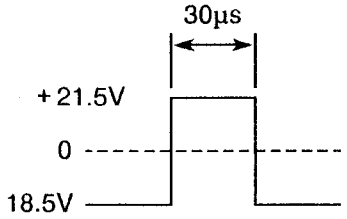
NOTES

1. Pulsed measurement: Pulse Length ≤300us, Duty Cycle ≤2.0%.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS



INPUT WAVEFORM



t_r, t_f < 10ns
Duty Cycle = 0.5%

BASE CURRENT

COLLECTOR CURRENT

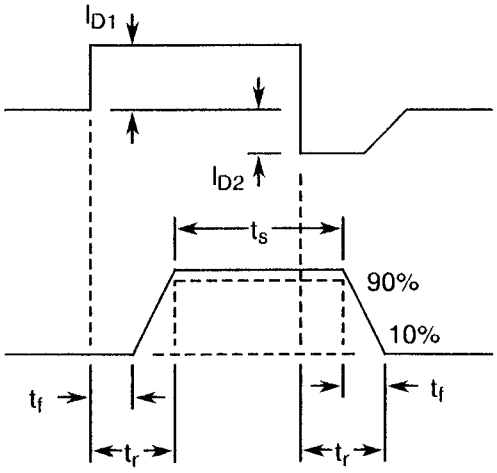


TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
4	Collector Saturation Voltage	$V_{CE(SAT)}$	As per Table 2	As per Table 2	±500	mV
6	Collector Cut-off Current	I_{CEX}	As per Table 2	As per Table 2	±3.0	µA
8	D.C. Forward Current Transfer Ratio 1	h_{FE1}	As per Table 2	As per Table 2	±25	%

TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+25 ±3	°C
2	Power Dissipation	P_{tot}	6.0 Note 1	W
3	Collector-Base Voltage	V_{CB}	100	Vdc

NOTES

1. No heatsink or forced air directed on the devices shall be permitted.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 5000)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured at intermediate points and on completion of endurance tests are scheduled in Table 6 of this specification.

4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for operating life testing shall be the same as specified in Table 5 for the burn-in test.

4.8.4 Electrical Circuits for Operating Life Tests

Not applicable.

4.8.5 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in ESA/SCC Generic Specification No. 5000. The temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
4	Collector Saturation Voltage	$V_{CE(SAT)}$	As per Table 2	As per Table 2	-	3.0	V
6	Collector Cut-off Current	I_{CEX}	As per Table 2	As per Table 2	-	10	µA
8	D.C. Forward Current Transfer Ratio 1	h_{FE1}	As per Table 2	As per Table 2	30	120	-